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IMPACT OF RESEARCH IN THE SOUTH

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AGRICULTURAL RESEARCH FOR DEVELOPMENT

Agriculture research in developing countries: from a "culture of promise" to a "culture of impact"

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CIRAD is the French agricultural research organization working for the sustainable development of tropical and Mediterranean regions. Together with its large network of scientific and development partners around the world, it generates scientific and technical knowledge in the field of agriculture and contributes to building the capacity of rural societies to adapt, learn and take innovative action in response to problems, needs and opportunities they face. This means understanding and being part of innovation systems at local and national levels and fostering the conditions that favour the use, adaptation and appropriation of that knowledge to be put in action.

APPLIED RESEARCH IS INCREASINGLY EXPECTED TO PROVE ITS USEFULNESS

Because agriculture is at the nexus of many burning issues, agricultural research for development is increasingly expected to contribute to solving societal challenges related to food security, sustainable intensification of agricultural production, ecological transitions, climatic change and poverty alleviation, among others. In doing so, it operates in a variety of contexts and partnerships with different types of stakeholders (researchers, farmers, advisory services, NGOs, private sector, etc.). In a context of acute tensions over funding dedicated to international agricultural research, donors and policy-makers expect researchers and their institutions to increase their accountability and demonstrate convincingly how public investments in research generate not only scientific results but contribute also to actual development impacts on the ground.

A PARTICIPATORY IMPACT EVALUATION METHOD APPLIED TO 13 CASE STUDIES AROUND THE WORLD

To better understand and document how CIRAD fosters innovation and produces impacts at scale over a long time frame, a task force developed and tested ImpresS[2], a participatory evaluation approach. Drawing on a collection of case studies, ImpresS has been used over the past several years to document the contribution of research to innovation processes in southern countries, and to measure the corresponding impacts, by taking into account the various stakeholders and beneficiaries involved. Through ImpresS, CIRAD also aims to improve researchers' contribution to development impact and boost their "culture of impact".

ImpresS is based on the "impact pathway" approach (Douthwaite et al. 2003). In a nutshell, it maps the inputs, outputs, outcomes and impacts produced within a given innovation process and then identifies causal links through a contribution analysis (Mayne, 2001). It also reconstitutes the narrative of the innovation, and analyses capacity development actions along the pathway and interactions with the broader environment, especially public policy actors. ImpresS renders it possible to open the "black box" of innovation and better understand when and how research activities contribute to the achievement of measurable and sustainable development goals on the ground. While inputs[3] and outputs[4] are usually fairly easy to identify, it is harder to determine the nature of outcomes[5] and impacts[6], their actual place and role in the impact pathway, and the contributions of research in their production. Stakeholders participate in the evaluation at different moments of the study. Despite certain drawbacks, participatory tools enable richer insights than more conventional approaches. ImpresS focuses on obtaining robust answers to three key questions: (1) what has changed for local stakeholders as a result of research interventions? (2) why did such changes happen as they did, and what was the actual contribution of research? and (3) what is the diversity and magnitude of the impacts associated with these changes?

By 2015, ImpresS had been applied to 13 case studies, illustrating the diversity of research that CIRAD and its southern partners have or are currently conducting (9 ex-post cases and 4 on-going or *in itinere* cases) in a variety of contexts and partnership arrangements. These cases cover three continents (9 cases in Africa, 2 in Latin America, 2 in Asia), and a diversity of innovation types[7].

1. Marie-Hélène Dabat, Bernard Triomphe, Agathe Devaux-Spatarakis, Syndhia Mathe
2. IMPact of RESearch in the South

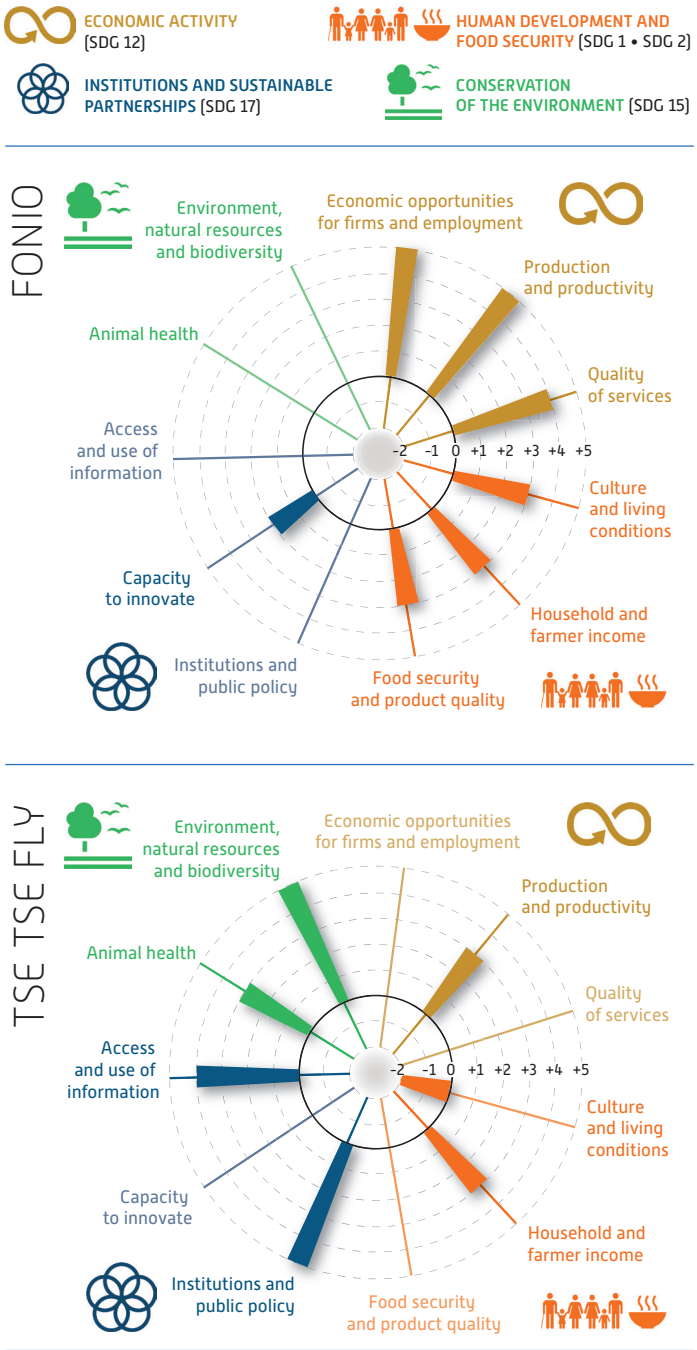
3. The resources used by the research team to produce scientific outputs.
4. The results produced by the research team (publications, technical novelty, etc.).
5. ImpresS defines outcomes as the appropriation of research results (outputs) by first beneficiaries or intermediate stakeholders which leads to technological adaptation, new rules and new organizations. Outcomes are the necessary changes which enable stakeholders to join and amplify the innovation process, which will eventually lead to actual impacts.
6. We distinguish primary impacts (impacts of the use of the innovation(s) on the stakeholders directly or indirectly interacting with research) and secondary impacts (scaling out or scaling up of this innovation to other territories and audiences; spillovers) (Barret et al., 2015)
7. Varietal breeding, resource management, integrated pest management, market access, animal health, etc. see http://impress-impact-recherche.cirad.fr/

KEY RESULTS

Widely diverse impacts built over the long-term

Over 100 (mostly positive) impacts were identified and characterized in the 13 ImpresS case studies. They include increased production and incomes, improved natural resource bases, better organizational settings and networking, increased access to remunerative markets, and changes in regulatory frameworks and policies. Some of the impacts appear rather original compared to those usually reported in the literature, or even to what was anticipated by the evaluation teams; they include improved social cohesion and dialogue within an entire value chain, increased well-being of rural actors, and an overall growth in environmental awareness. Some of the impacts were negative. In most cases, impacts were built up and obtained over a long period of time, often 20 years or more (Triomphe B. et al, 2015). To measure the impacts, each was graded by an expert panel using one or several qualitative or quantitative indicators revealed by the participatory process.

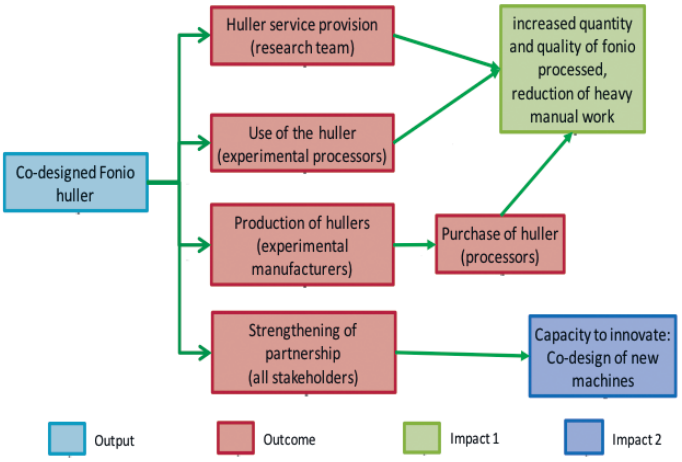
Grading the impacts and linking with the Sustainable Development Goals in two different case studies



Co-producing outputs and outcomes with stakeholders is key to impact

Across the 13 case studies, interactions between researchers and other actors throughout the innovation process were shown to be very important in every segment of the impact pathway. At the output level, these interactions lead to a variety of products: knowledge, methods, technologies, participatory experimental networks, among others. Interactions can generate a range of outcomes which are essential steps towards impacts: organizational resources such as coordination mechanisms, innovation platforms, new farmers' organizations or private firms; capacity building mechanisms such as training programmes and networks for sharing experiences; and new norms or policies. Many outcomes are co-produced, including those generated through participatory approaches, and often require that researchers play the role of intermediaries or innovation brokers.

Simplified impact pathway of the Fonio huller case



Capacity development, planned or unplanned, during the innovation process is an enabling factor for impact generation

In most of the case studies, capacity development took place during multiple "learning situations" at several stages of the innovation processes and in varying modes and intensities. The corresponding interactions involved several types of learning processes (formal and informal, individual and collective). ImpresS mapped and analyzed these capacity development processes, especially those involving research, by identifying key learning situations and understanding how the knowledge and practical skills learned produced outcomes and generated impacts. The resulting capacities are very diverse - technical, managerial, capacity to experiment, to learn, to interact with others – and depend on the specific innovations being developed. Together, they enable concerned stakeholders to develop a stronger capacity to innovate, as noted by Leeuwis in previous research (Leeuwis et al., 2014).

Interactions with public actors and policy-makers are necessary to foster innovation and generate impacts

Across the cases, public actors in charge of designing or implementing policy instruments at local or national levels were shown to play a pivotal role in the construction, development, dissemination and scaling phases of an innovation. Their involvement varied widely. In rare cases, public actors requested research to solve a problem. In many cases, they were requested by stakeholders to support the

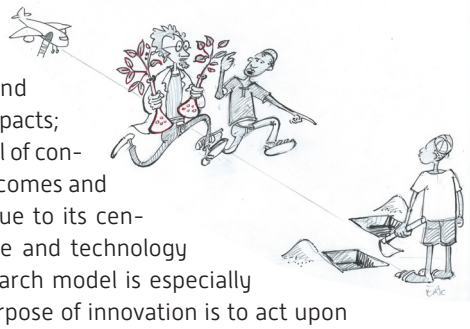
innovation process. In a few cases, public actors participated fully in the entire innovation process. Across the case studies, researchers interacted with policy makers in several ways and in pursuit of diverse objectives: to coproduce knowledge useful for action, align research with political agendas, facilitate access to funding, etc. These interactions contribute incidentally to strengthen public actors' own capacities. Certain individuals, at times scientists or leaders of interest groups, seem to play the role of "policy entrepreneurs" by facilitating the inclusion of knowledge and recommendations proposed by researchers in policy agendas. A key task is to ensure that the timeline of the innovation process remains coherent with policy agendas.

Research plays a variety of roles along the impact pathway

Due to the specific context in which innovation unfolds in southern countries, research must play multiple roles to achieve impact. Based on the results of ImpresS, we identified five key generic functions that research may play at different phases of the impact pathway: (1) knowledge production and dissemination, (2) co-design of innovations, (3) resource management, (4) capacity strengthening and (5) support and promotion of innovation. However, the roles researchers actually play in a given innovation process, depend on several factors: the weight of scientific knowledge in the innovation process; the level of implication and capacity of the stakeholders to fully participate; the socio-technical context in which the innovation process occurs; and finally the researchers' willingness and skills. This also means that the different roles played by research should be allocated among research teams based on their strengths and capacities, and interventions must be planned along the timeline of the innovation process.

Across the 13 case studies, we observed impact pathways that were widely diverse, varying in complexity, and with no single causal link leading to impact. How interactions between researchers and the innovation's stakeholders were configured constituted a determining factor in shaping the impact pathways (Devaux-Spatarakis A. et al., 2016). Based on this analysis, four different research models have been described. Each serves different functions and exercises different levels of control over the impact pathway. Most CIRAD research is represented by the first three.

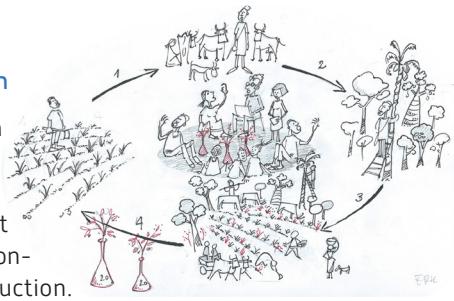
Participatory transfer of knowledge and technologies



In this model, research has a clear vision, objectives and strategy to achieve impacts; it can exert a high level of control over outputs, outcomes and the overall process due to its central role in knowledge and technology production. This research model is especially suitable when the purpose of innovation is to act upon the biophysical environment and does not necessarily require strong interactions with stakeholders or in-depth changes in the practices of actors to achieve impact. In such cases, what is mostly needed is a relevant strategy for implementing research, strong institutional and political support, a partnership with a few strategic stakeholders, the provision of adequate funding mechanisms, and training for actors involved in the use the technologies. These are consequently simple situations. "Eradication in Niayes region (Senegal) of Tsé-tsé flies using the sterile insect technique"[8] illustrates this first model.

8. http://impress-impact-recherche.cirad.fr/case-studies/tsetse-fly-eradication

Co-design of innovation

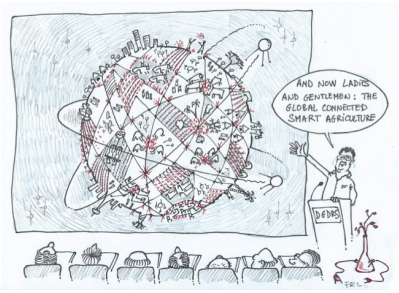


In this model, research has a clear vision about the objectives but does not know how to achieve them because it exerts a medium level of control over outcomes production. Knowledge is shared among many actors (farmers, NGOs, firms, advisory services, etc.) and the production of knowledge for action and the design of technologies require a participatory approach with co-learning processes and the co-production of outputs and outcomes. This research model is suitable when designing new farming systems or new equipment and the objectives, resources and constraints of partners need to be considered. What is needed is an adaptive strategy to build trust among partners, pay special attention to the capacity building of all of the actors and interact with policy makers for the scaling of the innovation. These are thus complex situations because all of the actors can influence the innovation process. The development of the hulling machine for fonio in West Africa[9] illustrates this second model.

Supporting the innovation process

In this model, objectives are defined with the stakeholders and research exerts a very low level of control over outcomes production because the innovation process is steered by the stakeholders. The main role of research here is to provide support to actors so that they may formulate innovative solutions to problems on their own. The role of the scientific knowledge is therefore variable because what really matters is the production of knowledge by the actors. This model is well suited to address complex problems involving many stakeholders and unpredictable interactions. Research can assist stakeholders with knowledge production, brokering activities and capacity development, but these may take many different forms and must be adapted to a diversity of unexpected challenges posed by external and internal factors. Many unexpected outcomes and impacts can emerge. The case of geographical indication for "Vales da Uva Goethe"[10] in Santa Catarina State, Brazil illustrates this third model.

Open innovation



In this model, research has a clear vision regarding outputs production but the outcomes to be produced are completely open. Scientific knowledge plays a critical role and research designs large parts of the technologies; however, research interacts with a large diversity of actors to jointly adapt these technologies within a process largely led by these actors. This model requires high investments in scientific knowledge production and technology design, a flexible strategy to interact with different partners and to seize unexpected opportunities, and clear rules for sharing property rights. This model is especially adapted to innovation related to the digital economy. The Pl@ntNet's case study[11] - a mobile interactive navigational tool and visual aid for plant identification- refers to this fourth model.

9. http://impress-impact-recherche.cirad.fr/case-studies/fonio-huller-whitener
10. http://impress-impact-recherche.cirad.fr/case-studies/geographical-indication
11. http://impress-impact-recherche.cirad.fr/case-studies/pl-ntnet

Illustrations: E. Vall/CIRAD

HOW ARE RESEARCH FUNDING BODIES CONCERNED?

Increasingly, organizations funding research and innovation are requesting researchers to demonstrate not only the scientific interest and social-economic utility of their research projects, but their potential impact as well. While it is essential to consider *ex ante* expected impacts, it may be risky to require a research project to determine the impacts that it will generate for the following reasons:

- The observation of the economic, social, environmental, territorial, and health impacts of research takes a long time – from 10 to 30 years depending on the type of research (Alston, 2009; Joly, 2015) – and these impacts may not be what were expected. Donors rarely take the time to evaluate ex-post with the benefit of hindsight the impacts of research projects they have funded, which all too often last just a few years. There consequently is a risk of developing a "culture of promise of impact" rather than a "culture of impact" among research operatives.
- The comparative review of the case studies shows that the relevant unit of analysis is a cluster of projects undertaken over a substantial period (10 years or more) around a given research question and through sustained partnerships, and not an individual project implemented over a short period (3 to 5 years). Other recent assessments (Asirpa, Impresa) have confirmed the relevance of this choice, which calls for long-term investments on research questions and for partnerships between research and development actors.
- The *ex ante* emphasis on impact may lead to a short term outlook promoting a particular kind of innovation and featuring misleading forms of "research marketing".

To strengthen the "culture of impact", we need methods and tools that can test impact expectations without limiting the possible outcomes of a project, and especially a cluster of projects, involved in an innovation process. These methods and tools should position the innovation within a systemic perspective, take into account the duration of the project(s), involve stakeholders, and use a range of potential scenarios to adjust the impact pathway as work progresses. They should combine the knowledge generated though prospective studies, impact assessments, and analyses of innovation processes. With this in mind, the results of ImpresS lead us to present and discuss several proposals to revise how projects are framed, formulated and implemented.

- The notion of a cluster of projects should be introduced into research programming to enable continuity in research work and partnerships with innovation stakeholders. Certain tools could be used at the project level, others at the cluster level.
- Beyond a review of the literature, the driving rationale of a research programme or project should draw from the experience of related projects and regular dialogue with research and development stakeholders (political, economic, farmers' organizations, NGOs...). Such discussions can reveal the complex interplay between actors within networks potentially concerned by the research and enable a joint definition of the type(s) of innovation(s) to develop.
- The *ex ante* characterisation of outcomes and impacts, technologies to develop and scientific knowledge to mobilize will provide a picture of partnerships to be established with stakeholders depending on their knowledge and capacity to innovate. This will help to anticipate which research model would be the most appropriate and the different roles research may have to play (see above).
- Critical capacities to be strengthened within both research and development partners should be systematically identified, including the types of knowledge and know-how needed to develop the innovation, the types of training to encourage, and the collaborative mechanisms needed to develop interactions and innovation.
- Different scenarios should be developed to lay out several possible impact pathways based on hypotheses formulated ex ante, the identification of critical points, and risk analysis. These impact pathways should specify the different roles expected of research at different stages of the project.
- A mechanism to monitor and assess these scenarios and hypotheses as the project progresses should be set up to enable activities and eventually the project work plan to be adjusted, which assumes that the specific resources needed to do so can be mobilized.

Evaluation programmes such as ImpresS and Impresa underscore the value of regularly conducting this type of methodological investigation to develop a culture of impact within European research institutions and enable new scientific advances to be integrated into evaluation design. ■

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